Response to AES Comments/Concerns Regarding
EPA Report on the Leaching Behavior of AGREMAX
EPA-600/R-12/724; December 2012

Note: this discussion focuses solely on EPA's assessment of the leaching potential of Agremax, and does not address questions concerning the manner of its land application in Puerto Rico, and whether that land application is a legitimate reuse or constitutes open dumping.

AES Comments/Concerns:

The comments of AES (letter of Jan 10, 2013) on EPA's assessment of Agremax make two basic arguments: 1) EPA's reference concentrations are inappropriate; and 2) the LEAF leach test results were used in a screening assessment that is not adequately site-specific.

Other objections they make are that it is inappropriate to use the LEAF methods because they are new and have not been used in regulatory or enforcement contexts. They argue that "long-validated" leach test methods such as TCLP or SPLP should be used instead.

Response: While TCLP and SLPL[SPLP?] are both long established tests and have appropriate uses, they do not represent the best science regarding the leaching assessment potential of Agremax in a roadbed or fill reuse setting. TCLP was developed for assessing the leaching potential of materials disposed or potentially disposed in an MSW landfill. Its buffered pH 5 acetic acid leaching solution, while reflective of MSW codisposal conditions, does not reflect the land application conditions for Agremax. Neither EPA nor AES anticipate that Agremax will be exposed to pH 5 leaching conditions, and there is no plausible source for the acetic acid used in TCLP. Both TCLP and SPLP are single point screening leach tests, and so can only ever provide a screening assessment. Also both tests focus on initial leachate properties, not final leaching conditions, and do not compare final test conditions with plausible field conditions, so there is no attempt to validate TCLP or SPLP results against plausible field conditions for particular instances of disposal or manner of reuse.

While new, the LEAF methods have been developed though extensive research published in more than 30 scientific journal articles over a period of more than 15 years by researchers in both the U.S. and several European countries. They have been used by EPA in an extensive study of CCR leaching potential (EPA reports in 2006, 2008, and 2009), and earlier (developmental) versions of the tests have been reviewed through a consultation with EPA's Science Advisory Board (SAB; in 2003). The LEAF methods have been through precision validation testing and are the subject of a field validation study. The precision and accuracy validation of the LEAF methods is more extensive than that done for TCLP, SPLP, and most other published leach test methods (Note—I do not know of any, but never say never). The parameters varied in the two LEAF tests used to evaluate Agremax (pH in 1313 and the L/S ratio in 1314) both vary in the environment and strongly influence leaching potential, particularly for many of the metals that are waste constituents of concern (COCs). Method 1313 has been posted as a new method on EPA's analytic methods website since September, 2012, and Method 1314 is expected to be posted there in the next several weeks. All four methods have been publicly available at the developer's website (Vanderbilt University) for the past several years.

AES concern regarding benchmarks:

AES' first fundamental concern is that drinking water MCLs are more appropriate reference concentrations for comparison than are the Region 9 screening levels (RSLs), and that further, the comparison should only be made after application of a modeled groundwater dilution and attenuation factor (DAF). While the EPA assessment used some MCLs and some Region 9 values (choosing the lower, or more protective of the values available for consideration), the screening values used in the study for the two constituents of greatest concern, arsenic and chromium, are from the Region 9 RSLs.

Response:

AES' concern about EPA's failure to apply DAFs to the leach testing results before comparison with health benchmarks is addressed below.

Concerning EPA's selection of health benchmarks for comparison, AES argues that drinking water MCLs are the most appropriate health bench mark because they are legally enforceable regulatory values used to control the quality of drinking water delivered to customers of public water systems. That is, the general population is allowed to be delivered for human consumption water containing up to MCL concentrations of chemical constituents.

EPA had several concerns in setting its criteria for selecting benchmark values for comparison with the leach test results. The first concern was that MCLs are not strictly health based. While public health protection is the key concern in establishing these values, the treatability of water and the national cost of treatment to different concentrations for any particular constituent are also considered[1]. For arsenic, this resulted in an MCL of 10 ug/l, which was estimated to represent a lifetime individual 90th percentile cancer risk of between 1 and 6 chances out of 10,000[2]. However, in assessing the hazards posed by waste disposal, the Agency typically regulates to a risk level of 1 in 100,000, and considers

[1]" Today's rule, with a final MCL of 10 μg/L, reflects the application of several provisions under SDWA, the first of which generally requires that EPA set the MCL for each contaminant as close as feasible to the MCLG, based on available technology and taking costs to large systems into account. The 1996 SDWA amendments also require that the Administrator determine whether or not the quantifiable and nonquantifiable benefits of an MCL justify the quantifiable and nonquantifiable costs." See 66 FR 7020, January 22, 2001.

[2] See Tables III.D.2(b) and (c), 66 FR 7008, January 22, 2001.

waste posing a risk of 1 in 10,000 to potentially pose a substantial risk to human health or the environment.[3] [Note: could add something about what we did in CCR rule proposal & risk assessment] Therefore, in a regulatory program such as that under RCRA , intended to prevent groundwater contamination that may potentially result in substantial risk to human health and the environment, a regulatory value representing a lifetime cancer risk greater than 1 in 10,000 is an inappropriate benchmark. This is particularly the case in instances where the existing groundwater contains constituents of potential concern at concentrations below the 1 in 10,000 risk level. As a policy matter, land application of wastes should not allow clean groundwater to become contaminated up to a concentration corresponding to a lifetime cancer risk of 1 in 10,000.

Concerning the drinking water MCL for chromium, recent research indicates that chromium may pose carcinogenic risk to humans when ingested, while the MCL is based on non-cancer adverse effects (as well as feasibility and cost considerations as described above). While the chromium MCL has not yet been updated to incorporate this recent research, a new assessment such as EPA's evaluation of Agremax is obligated to consider the best science available at the time the assessment is conducted. As the Region 9 RSL values do account for this recent science the RSL for chromium is the more appropriate value to use, again, particularly in a program intended to prevent groundwater contamination that may potentially result in substantial risk to human health and the environment.

In expressing their second concern, AES identifies several aspects of the EPA assessment to which they object, and which can be summarized as a concern that the assessment is too generic and not site specific (although they do not argue it in exactly this way). AES makes the following assertions in their comments:

- EPA did not conduct groundwater fate and transport modeling , which would identify plausible the dilution/attenuation that would occur before an actual exposure.
- In Method 1314 (the column test, which uses DI water) the pH remained between 10 and 11, narrower than the pH range of 6.5-11.5 used for the data selected for comparison with the reference values. AES argues that the pH6.5-11.5 range is unrealistic.
- The report compares only the maximum leach test results with the reference values, and not the full range of results.
- The report selects test results from the low liquid/solid ratio data, which AES believes biases the results high.

AES concern:

EPA did not conduct groundwater fate and transport modeling , which would identify

[3] "Wastestreams for which these risks are calculated to be 1x 10- 4 or higher, or 1 or higher HQs or EQs for any individual non-carcinogen, or non-carcinogens that elicit adverse effects on the same target organ, generally will be considered to pose a substantial present or potential hazard to human health and the environment and generally will be listed as hazardous waste. " See 59 FR 66075-77, December 22, 1994.

plausible the dilution/attenuation that would occur before an actual exposure.

Response:

The evaluation that was performed for ORD regarding Agremax was a screening assessment and not a complete risk assessment. As noted on page 13 of the report, groundwater fate and transport modeling to estimate the likelihood of COC transport to a nearby drinking water well was not conducted. However, the leaching data generated and provided in the EPA report could be used to develop a source term for such an assessment which could be done once for use generally on Puerto Rico, or case-by-case. To do so, details describing the manner of Agremax land application and other meteorological and hydrogeologic data would be needed. DAF values can vary considerably depending on factors such as rainfall, depth to groundwater, soil type and others. For example, EPA used a generic DAF of 100 in establishing its Toxicity characteristic regulation.

AES Concern:

In performing Method 1314 (the column test, which uses DI water) the pH of the eluate remained between 10 and 11, narrower than the pH range of 6.5-11.5 used for the data selected for comparison with the reference values. AES argues that the pH 6.5-11.5 range is unrealistic, and provides a calculation based on rainfall acidity and the amount of rainfall purporting to support this conclusion.

Response:

The eluate pH generated by Agremax in Method 1314 was in the range of pH 10-11, and if Agremax neutralization by acidic rain was the only source of pH change over time, an extended time period would be required to substantially reduce the pH of the material. However, two other important processes will also contribute to decreasing the pH of the material: washout depletion of soluble alkaline cations, particularly calcium, and carbonation of the Agremax. (i.e., reaction of atmospheric carbon dioxide with calcium to form calcium carbonate). The rate of pH change due to these factors will depend on a number of factors, including particle size and relative humidity. No attempt to estimate the rate of pH change in the material was done for this screening assessment.

AES concern:

The report compares only the maximum leach test results with the reference values, and not the full range of results.

Response:

In a screening assessment such as this values in the higher part of the distribution are used to try to ensure that the assessment identifies an outer bound for the likely release potential. However, even in performing a more complete risk assessment, results from the higher end of the risk distribution (e.g., 90th percentile) are typically relied on as benchmarks to ensure that the assessment is protective in most cases.

Moreover, for the two constituents of greatest concern in this assessment, Arsenic and Chromium, relying on the Method 1313 leaching results from AES' preferred pH range of pH 10-11 would change the assessment very little. In fact, for chromium, the maximum leaching value (0.015 mg/l) occurred in the pH range of 10-11. For Arsenic, the leaching level in the pH 10-11 range would be approximately half of the maximum value (0.051 mg/l) used in the report. An assessment relying on the full range of leach test results would result in only small changes to the values to be compared with the benchmarks.

Finally, in arguing that the LEAF methods were improperly applied, AES turns Colombia Falls Aluminum on its head. This is particularly true in light of AES' stated preference for the use of TCLP, which was designed to reflect municipal solid waste landfill conditions, few of which are likely to occur in the context of Agremax placement on the land. In contrast, the LEAF methods as applied in this screening assessment consider the likely initial leaching pH (i.e., pH10-11), as well as pH values that may plausibly occur as the Agremax remains on the land and is exposed to rainfall and other environmental conditions that will all drive the pH of the material lower over time. The degree and rate at which this occurs will vary depending on environmental conditions as well as the form of Agremax (e.g., particle size) and manner of its placement on the land. This much more detailed assessment was not done as apart of the screening assessment.

AES concern:

The report selects Method 1314 test results from the low liquid/solid ratio data, which AES believes improperly biases the results high.

Response:

As noted earlier, the maximum leaching concentration was used for comparison with the benchmarks as part of the screening assessment. The low L/S data from Method 1314 indicate the initial leachate concentration, and this initial value can affect groundwater modeling results (i.e., the estimated DAF and the peak concentration reaching the well) . With more complete data on rainfall amount ant patterns and the form and manner of land application of Agremax, the time required to achieve the higher cumulative or averaged L/S ratios can often be estimated.